Aberdeen Group
Research Brief
Insights and Advice

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IBM Puts a Pragmatic Face on Advanced Inventory Optimization

Overview

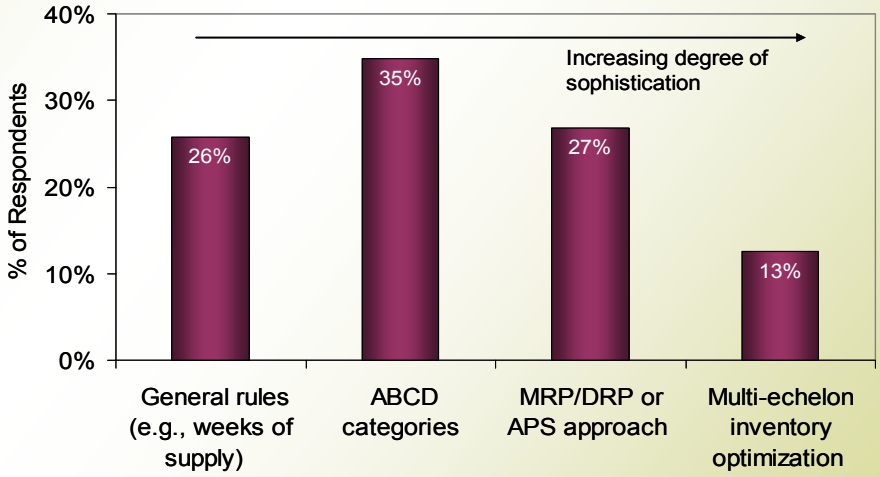
Inventory optimization is one of the hottest supply chain improvement areas. IBM's Dynamic Inventory Optimization Solution is a packaged software application that helps companies reduce inventory investment while maintaining or improving customer service levels. The solution, which is most appropriate for finished goods or replenishment spare parts, is particularly attractive for companies wishing to improve their inventory practices in a step-wise, rather than a big bang, fashion.

Analysis and Recommendations

IBM's commercialization of its Dynamic Inventory Optimization Solution comes at an opportune time. Inventory optimization and replenishment management technology is the top-rated area companies wish to improve to drive supply chain innovation, according to a March 2006 Aberdeen poll.

In the rush to install demand planning applications, constraint-based manufacturing systems, and distribution requirements planning (DRP) systems in the 1990s, most companies and software vendors ignored the area of optimized inventory policy setting. Instead, when implementing ERP or advanced planning and scheduling (APS) systems, they often inputted static inventory target parameters. These settings most often were based on simple rules, such as holding two weeks of supply for all products at a location, or a basic ABCD analysis, or an APS approach that ignored the effect of inventory in other tiers of the supply chain or poorly accounted for demand and supply variability (Figure 1).

Figure 1: How Companies Set Inventory Policies



Source: AberdeenGroup

Announcement

Is Software as a Service right for your supply chain? Find out in *The On-Demand Tipping Point in Supply Chain Report.*

With today's business pressures forcing companies to seek new ways to increase supply chain velocity and better serve the varying requirements of customers and channels, inventory optimization is becoming a cornerstone for improvement. In particular, companies are becoming better educated on the value of more sophisticated and automated inventory target setting approaches.

Any company that has a considerable inventory investment or is under pressure from customers to improve service levels and fill rates should be reexamining its approach to setting inventory targets and looking at how optimization tools can help. Note that inventory optimization tools typically are not a replacement for existing ERP or APS tools. Rather, they are an extension that helps these solutions work better by providing them with improved safety stock and economic order size parameters.

IBM Inventory Optimization: A Client-Driven Evolution

To help clients use inventory more effectively, IBM has commercialized its Dynamic Inventory Optimization Solution, which was developed over the course of 30 consulting engagements with customers in Europe and North America. IBM consultants around the world are now able to deliver the packaged inventory solution to clients.

Nearly a dozen companies have implemented the Dynamic Inventory Optimization Solution software for use in their daily operations. In addition to selling the software via a fixed fee pricing model, IBM continues to use the software during consulting engagements, such as for setting optimum lot sizes or service level settings when implementing an ERP system. A multi-user version with a service-oriented architecture is scheduled for release in late 2006.

Inventory Target Approaches

- √ **General rules-based approach:** Set blanket inventory targets for product lines or facilities, frequently as a static "weeks of supply" rule.
- √ **ABCD approach:** Categorize inventory into fast, frequent, and sporadic movers and apply inventory targets to each category.
- √ **MRP/DRP and APS approach:** Use a deterministic approach to compute inventory targets, which are computed sequentially for each supply chain echelon (tier); assumes a normal demand distribution.
- √ **Multi-echelon inventory optimization approach:** Use a stochastic (probabilistic) approach to compute inventory targets in one pass across multiple echelons. This approach accounts for supply chain variability (e.g., real demand distribution or lead time variability) and the interdependencies across multiple echelons.
- √ **IBM's approach:** The Dynamic Inventory Optimization Solution can accommodate all the approaches listed above, which is particularly useful for evaluating different policy options. Multi-echelon capabilities are limited to optimizing simultaneously two nodes across two levels; the system uses a multi-pass solving method for calculating inventory targets across large-scale networks.

For a more in-depth discussion, read *Are Your Inventory Management Practices Outdated?*

The results of the Dynamic Inventory Optimization Solution have been impressive: A study of recent deployments found that 13 out of 14 assessments identified inventory savings of over 30%, compared to existing client levels, while holding or improving projected customer services levels. Client successes include:

- Automotive components manufacturer Mann + Hummel uses the solution to forecast demand and calculate reorder points and order quantities for each inventory item at its central

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aftermarket parts warehouse based on SAP transaction and product master data. The solution identified how to lower stock levels by 30% while keeping customer service levels at 97% and reducing production order lines by 18%.

- Home improvement retailer Max Bahr uses the system daily to calculate replenishment orders for its more than 80 stores. The system is able to produce 90% of the replenishment orders without human oversight and has improved shelf level availability to 99% while reducing replenishment costs.

Inventory Optimization: Flexibility vs. Dogma

One challenge with advanced inventory optimization is that it often takes a leap of faith that a "black box" optimizer can be trusted to meet business requirements. IBM's approach has been to create a flexible, understandable solution versus the ultimate optimization engine.

The IBM solution is able to model and support a company's current inventory policy technique, whether it is an ABCD process, a rules-based approach like weeks of supply, or SAP's APO system. Using the solution, users (or IBM consultants) can run what-if simulations on how inventory investment or service levels can be improved by applying more sophisticated techniques. This approach helps users understand how and why policies are being recommended and craft alternative scenarios.

IBM's approach is attractive to companies suspicious of vendors' generic savings assessments or wary of extrapolating cost savings from small data sets.

The optimization assessment is typically run on a company's entire SKU base, not just select SKUs, to provide an accurate picture of the full cost and service benefits of alternate methods. This is attractive to companies suspicious of vendors' generic savings assessments or wary of extrapolating cost savings from small data sets.

Based on a company's comfort level with change, an enterprise can choose to move directly to the most advanced technique, stochastic-based multi-echelon inventory optimization, or it can choose to start slowly by, say, having the system set better parameters for its current ABCD method. For companies fearful of shocking their supply base or distribution channels with big shifts in policies, IBM's approach of letting a company change its policies at its own speed in a step-wise fashion rather than a quantum leap provides extra comfort.

IBM's solution is not as comprehensive in its multi-echelon capabilities as some other market offerings. The application employs a multi-pass rather than a single pass approach to solve networks more complex than two nodes across two levels. And while the solution takes into account lead time variability, it doesn't model such supply variables as yield rates and processing time variability. In addition, the solution is not currently meant for raw material and work in process inventory optimization, as it does not support bill of material explosions.

That said, the solution is appropriate for a wide variety of finished goods and replenishment spare parts environments. For many companies, the significant inventory and service improvement that they can gain with the IBM solution coupled with its transparency and understandability outweigh any multi-echelon tradeoffs because operations is more likely to feel comfortable with (and execute) the resulting policies.

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Key Solution Components

The Dynamic Inventory Optimization Solution is a feature-rich portfolio of tools for strategic, tactical, and operational inventory management. To identify opportunities for reducing inventory investments or improving service levels, the solution can consider many factors, such as service levels, demand variability (using a stochastic approach), lead times and variations, batch sizes, and inventory overage and underage levels. Its key capabilities are to classify all SKUs, set optimal replenishment policies for each SKU class, and calculate the optimal lot size and safety stock for each SKU to achieve lowest cost. The results can be used to create inventory action lists for planners or automatically readjust inventory parameters in an ERP or APS system.

The stock forecasting and analysis tools are the heart of the solution. There are also optional replenishment and forecasting tools for companies that lack a modern ERP or APS system and prefer to purchase a single integrated system from IBM.

Stock Analysis Tools

The solution includes tools to help companies classify their SKUs and understand tradeoffs between ordering frequency, inventory value, and total cost. The solution uses a K-Curve approach (a modified economic order quantity formula) to classify all items into a given number of classes, with each class having its own order frequency. Although the K-Curve approach is not mathematically optimal, it produces better results than standard ABCD analysis and enables pragmatic order frequencies that can be executed in real life, even for varying demand or short life cycle items. Once inventory is classified, safety stock and economic order quantities are determined. The system can also calculate a mathematically optimal result if desired.

The stock forecasting and analysis tools are the heart of the solution but there are also optional replenishment and forecasting tools.

The solution uses a stochastic (probabilistic) approach for evaluating demand and lead times. Another example of the solution's real-world focus is that it contains a mosaic of ways to set lead time variability. If a company lacks detailed, high-quality lead time data to input into the system, a user can instead input set values for lead time variability (e.g., variability equals plus or minus three days or 10% of standard lead time). Different lead time variability approaches can be used for different products, enabling companies to use the system even if their data is incomplete.

A stock simulation window helps users simulate delivery rules and replenishment rules. For instance, if Wal-Mart asks me to replenish more frequently, what is the cost impact? What is the cost impact if I also offer more frequent replenishment to my other mass merchant customers? Normal, rush, and back orders can be simulated with their associated safety stocks.

The Budget Optimization plug-in module can be used to optimize where to hold inventory locally vs. centrally by SKU. This cost-based optimization is done using a multi-echelon inventory optimization approach. The module also supports mix optimization, which assigns different service levels to different SKUs so that, in aggregate, they meet the overall customer-defined class target with less inventory expense.

Replenishment Tools

The pragmatic nature of the Dynamic Inventory Optimization Solution shines through again in the system's optional replenishment tools. These tools can be used to calculate improved SKU-

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level replenishment parameters (e.g., reorder point and order quantity) and to generate specific replenishment orders using daily point of sale and other information. Core to the usability of the system is that client-specific replenishment logic and flexible business rules are taken into account. These could include knowing that orders cannot be placed on a specific supplier on holiday dates, considering minimum order sizes to obtain free shipping, factoring in capacity constraints of an inventory cage, considering compound pallet rules (e.g., if I buy 1 pallet of product A, then I also must buy 3 pallets of product B), incorporating cannibalization logic, and supporting product termination rules. The replenishment tools do not include forward buy logic or price elasticity/markdown optimization support.

Forecasting Tools

Another optional component is forecasting. This basic system uses a "pick-best" forecasting method with SKU-level parameter definition and supports variable time buckets. It also contains a data management tool for removing outliers, effects of promotions, and so on.

System Extensibility

The Dynamic Inventory Optimization Solution is built with a plug-in architecture to support client-specific extensions and to take advantage of the industry expertise of IBM consultants. A macro language can be used by IBM consultants and even by customers to create new plug-ins. Plug-ins used multiple times in the field will eventually be brought into the core product and made available for all users. The Budget Optimization module is an example of a field-developed plug-in that is now a standard solution option.

Who Should Consider IBM's Inventory Optimization Solution?

Companies seeking to improve their inventory performance should consider IBM's Dynamic Inventory Optimization Solution if they:

- Have finished goods inventory or replenishment spare parts to manage.
- Are in an industry such as consumer goods manufacturing or distribution, fast-moving consumer goods retail, make-to-stock manufacturing, industrial or health care distribution, chemicals, or aftermarket spare parts such as automotive components.
- Seek a pragmatic solution that will let inventory planners have transparency to the solution methods and the ability to gradually adopt more sophisticated approaches.
- Seek IBM consulting expertise for inventory best practices and change management.

Keep in mind that the Dynamic Inventory Optimization Solution can work with SAP or other ERP solutions as an add-on planning component, making software like APO more effective. The solution can also operate in a non-ERP environment as a fully integrated replenishment system. In addition, IBM consultants can employ it during an engagement to perform a stand-alone inventory assessment.

Recommendations for Action

√ Any company with a considerable inventory investment or that is under pressure from customers to improve service levels and fill rates should be reexamining its approach to setting inventory targets.

√ Consider the IBM solution for improving finished goods or replenishment spare parts inventory management.

√ View inventory optimization as an extension that can make your ERP or APS system more valuable.

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Who Should Consider Alternative Solutions?

Companies should seek alternative inventory optimization solutions if they seek a solution that will:

- Optimize raw material or work in process inventory.
- Optimize inventory location and quantity across multi-stage manufacturing and assembly operations or postponement operations.
- Calculate spare parts inventory parameters in which repairs or refurbishments need to be managed or mean time to failure needs to be calculated – e.g., airplane engines.
- Optimize inventory in fashion retail (e.g., seasonal apparel).
- Optimally take into account multiple elements of supply variability (e.g., yield rates, and processing times) in a multi-echelon optimization model.

Related Research

The On-Demand Tipping Point in Supply Chain Report, March 2006

Are Your Inventory Management Practices Outdated?, March 2005

Best Practices in International Logistics: Eight Case Studies of Success; January 2006

Supply Chain Inventory Strategies Benchmark Report; December 2004

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